IOT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE

Team ID : PNT2022TMID43901

Team Members

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INTRODUCTION

PROJECT OVREVIEW:

Crops in farms are many times ravaged by local animals like buffaloes, cows, goats, birds etc. this leads to huge losses for the farmers. It is not possible for farmers to barricade entire fields or stay on field 24 hours and guard it.so here we propose automatic crop protection system from animals. This is a microcontroller based system using PIC family microcontroller. The microcontroller now sound an alarm to woo the animal away from the field as well as sends SMS to the farmer so that he may about the issue and come to the spot in case the animal don't turn away by the alarm. This ensures complete safety of crop from animals thus protecting farmers loss.

PURPOSE:

Our main purpose of the project is to develop intruder alert to the farm, to avoid losses due to animal and fire. These intruder alert protect the crop that damaging that indirectly increase yield of the crop. The develop system will not harmful and injurious to animal as well as human beings. Theme of project is to design a intelligent security system for farm protecting by using embedded system.

LITERATURE SURVEY

EXISTING PROBLEM:

The existing system mainly provide the surveillance functionality. Also these system don't provide protection from wild animals, especially in such an application area. They also need to take actions based on the type of animal that tries to enter the area, as different methods are adopted to prevent different animals from entering restricted areas. The other commonly used method by farmer in order to prevent the crop vandalization by animals include building physical barriers, use of electric fences and manual surveillance and various such exhaustive and dangerous method.

REFERENCES:

i. Mr. Pranav shitap, Mr. Jayesh redj , Mr .Shikhar Singh, Mr. Durvesh Zagade, Dr. Sharada Chougule. Department of ELECTRONICS AND TELECOMMUNICATION ENGINEERING, Finolex Academy of Management and technology, ratangir i, India.

ii. N .Penchalaiah, D. Pavithra, B. Bhargavi, D.P .Madhurai,
K. EliyasShaik, S.Md. sohaib.Assitant Professor, Department of CSE,AITS, Rajampe t,India UG Student, Department of CSE ,AITS , Rajampet, India.

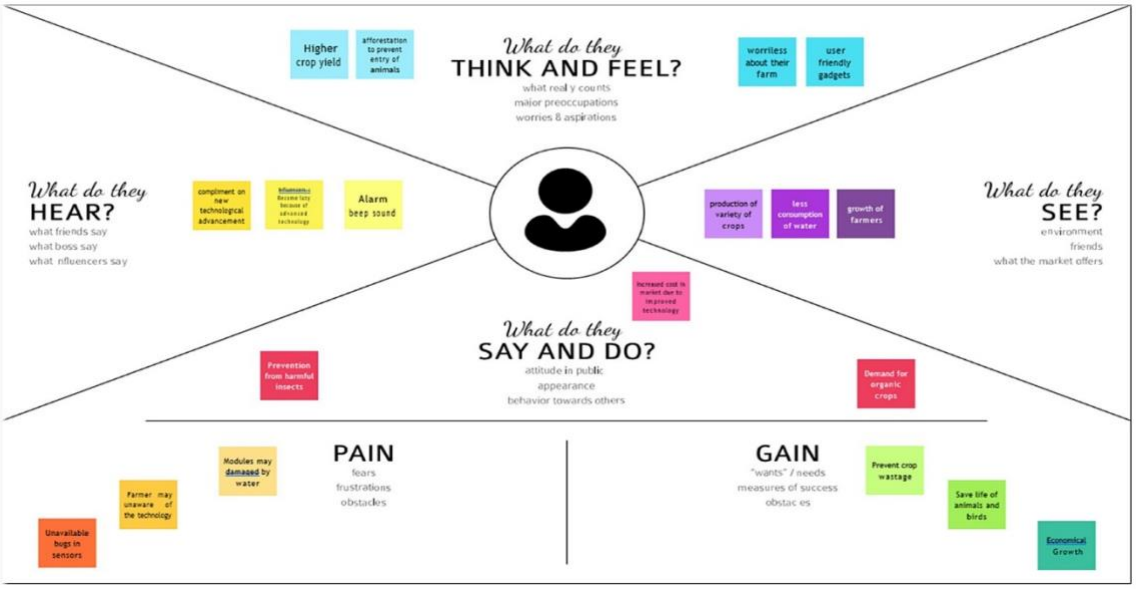
PROBLEM STATEMENT DEFINITION STATEMENT:

In the world economy of many Country dependent upon the agriculture.

In spite of economic development agriculture is the backbone of the economy. Crops in forms are many times ravaged by local animals like buffaloes, cows, goats, birds and fire etc. this leads to huge loss for the farmers.it is not possible for farmers to blockade to entire fields or stay 24 hours and guard it. Agriculture meets food requirements of the people and produces several raw materials for industries. But because of animal interference and fire in agricultural lands, there will be huge loss of crops. Crops will be totally getting destroyed.

IDEATION AND PROPOSED SOLUTION

EMPATHY MAP CANVAS:



Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

a. Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

b. Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

c. Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

An Advanced Smart crop protection system helps the farmers from preventing crops from damage by animals .The setup should be easy to handle in user friendly android based mobile device.

Key rules of brainstorming

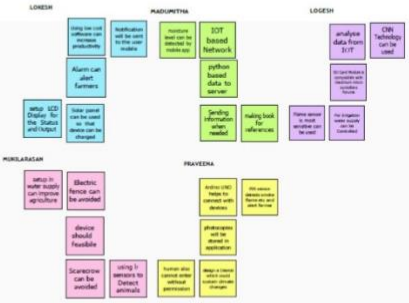
To run an smooth and productive session

Stay in topic.
Defer judgment.
Go for volume.
Encourage wild ideas.
Listen to others.
If possible, be visual.

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes



Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

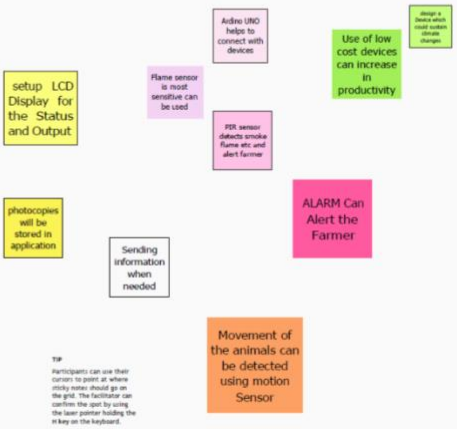
20 minutes

TIP
Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

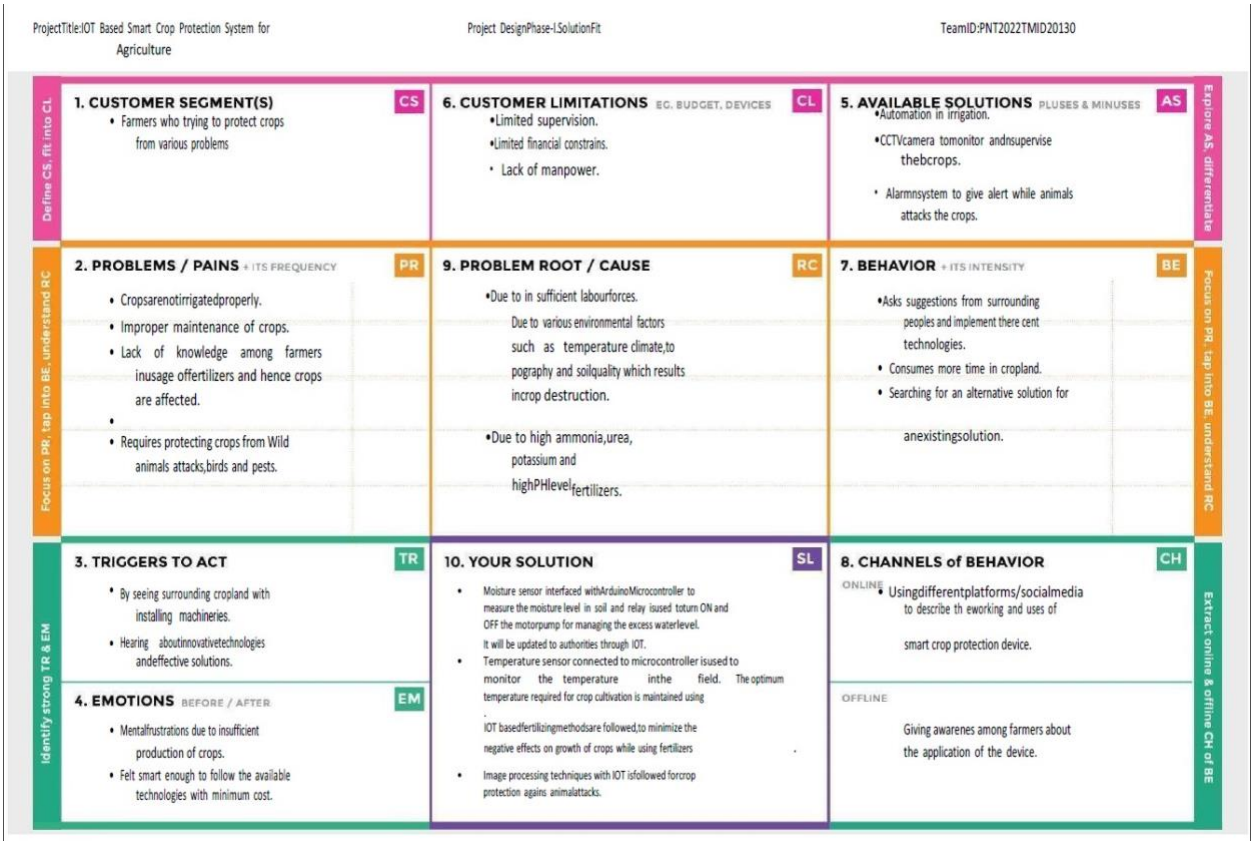


TIP
Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the H key on the keyboard.

PROPOSED SOLUTION:

S.NO.	Parameter	Description
1.	Problem Statement. (Problem to be solved)	✓ Crops are not irrigated properly due to insufficient labour forces. ✓ Improper maintenance of crops against various environmental factors such as temperature climate, topography and soil quantity which results in crop destruction. ✓ Requires protecting crops from wild animals attacks birds and pests.
2.	Idea /Solution Description.	✓ Moisture sensor is interfaced with Arduino Microcontroller to measure the moisture level in soil and relay is used to turn ON & OFF the motor pump for managing the excess water level. It will be updated to authorities through IOT. ✓ Temperature sensor connected to microcontroller is used to monitor the temperature in the field. ✓ Image processing techniques with IOT is followed for crop protection against animal attack.
3.	Novelty / Uniqueness.	✓ Automatic crop maintenance and protection using embedded and IOT Technology.
4.	Social Impact / Customer satisfaction.	✓ This proposed system provides many facilities which helps the farmers to maintain the crop field without much loss.
5.	Business Model (Revenue Model).	✓ This prototype can be developed as product with minimum cost with high performance.
6.	Scalability of the solution	✓ This can be developed to a scalable product by using solution sensors and transmitting the data through Wireless Sensor Network and Analysing the data in cloud and operation is performed using robots.

PROBLEM SOLUTIONFIT:



ProjectTitle:IOT Based Smart Crop Protection System for Agriculture

Project DesignPhase-I.SolutionFit

TeamID:PNT2022TMID20130

Define CS, fit into CL

1. CUSTOMER SEGMENT(S) CS

- Farmers who trying to protect crops from various problems

6. CUSTOMER LIMITATIONS EG. BUDGET, DEVICES CL

- Limited supervision.
- Limited financial constrains.
- Lack of manpower.

5. AVAILABLE SOLUTIONS PLUSES & MINUSES AS

- Automation in irrigation.
- CCTVcamera tomonitor andnsupervise thebcrops.
- Alarmnsystem to give alert while animals attacks the crops.

Explore AS, differentiate

Focus on PR, tap into BE, understand RC

2. PROBLEMS / PAINS + ITS FREQUENCY PR

- Cropsarenotirrigatedproperly.
- Improper maintenance of crops.
- Lack of knowledge among farmers inusage offertilizers and hence crops are affected.
- Requires protecting crops from Wild animals attacks,birds and pests.

9. PROBLEM ROOT / CAUSE RC

- Due to in sufficient labourforces.
  Due to various environmental factors such as temperature climate,to pography and soilquality which results incrop destruction.
- Due to high ammonia,urea, potassium and highPHlevelfertilizers.

7. BEHAVIOR + ITS INTENSITY BE

- Asks suggestions from surrounding peoples and implement there cent technologies.
- Consumes more time in cropland.
- Searching for an alternative solution for anexistingsolution.

Focus on PR, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TO ACT TR

- By seeing surrounding cropland with installing machineries.
- Hearing aboutinnovativetechnologies andeffective solutions.

4. EMOTIONS BEFORE / AFTER EM

- Mentalfrustrations due to insufficient production of crops.
- Felt smart enough to follow the available technologies with minimum cost.

10. YOUR SOLUTION SL

- Moisture sensor interfaced withArduinoMicrocontroller to measure the moisture level in soil and relay isused toturn ON and OFF the motorpump for managing the excess waterlevel. It will be updated to authorities through IOT.
- Temperature sensor connected to microcontroller isused to monitor the temperature inthe field. The optimum temperature required for crop cultivation is maintained using IOT basedfertilizingmethodsare followed,to minimize the negative effects on growth of crops while using fertilizers
- Image processing techniques with IOT isfollowed forcrop protection agains animalattacks.

8. CHANNELS of BEHAVIOR CH

ONLINE

- Usingdifferentplatforms/socialmedia to describe th eworking and uses of smart crop protection device.

OFFLINE

Giving awarenes among farmers about the application of the device.

Extract online & offline CH of BE

REQUIREMENT ANALYSIS

FUNCTIONAL REQUIREMENT:

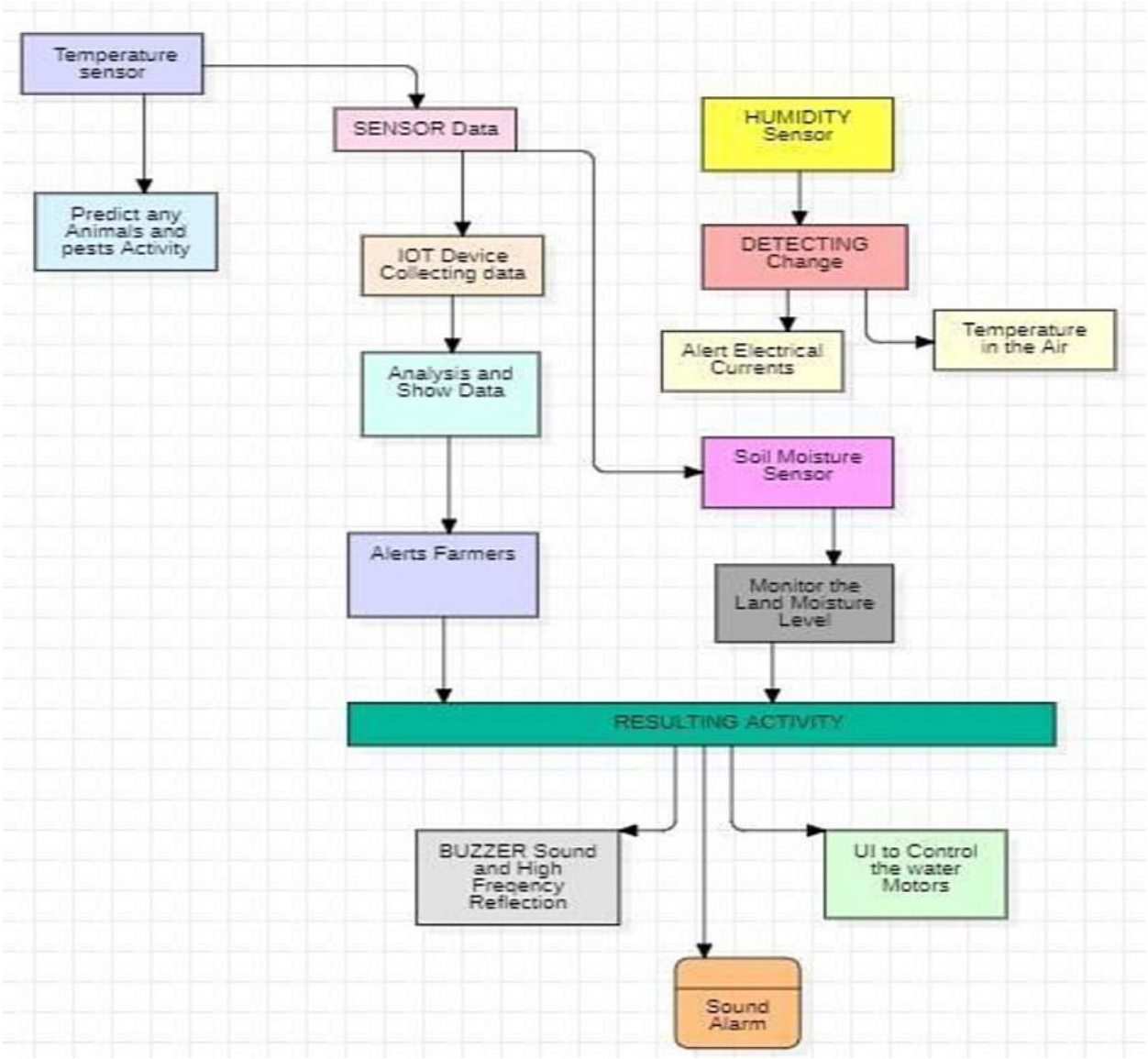
S.NO.	Functional Requirement.	Sub Requirement.
1.	User Visibility	Sense animals nearing the crop field & sounds alarm to woo them away as well as sends SMS to farmer using cloud service.
2.	User Reception	The Data like values of Temperature, Humidity, Soil moisture Sensors are received via SMS.
3.	User Understanding	Based on the sensor data value to get the information about the present of farming land.
4.	User Action	The User needs take action like destruction of crop residues, deep plowing, crop rotation, fertilizers, strip cropping, scheduled planting operations.

NON FUNCTINAL REQUIREMENT:

S.NO.	Non-Functional Requirement.	Description.
1.	Usability	Mobile Support Users must be able to interact in the same roles & tasks on computers & mobile devices where practical, given mobile capabilities.
2.	Security	Data requires secure access to must register and communicate securely on devices and authorized users of the system who exchange information must be able to do.
3.	Reliability	It has a capacity to recognize the disturbance near the field and doesn't give a false caution signal.
4.	Performance	Must provide acceptable response times to users regardless of the volume of data that is stored and the analytics that occurs in background. Bidirectional, near real-time communications must be supported. This requirement is related to the requirement to support industrial and device protocols at the edge.
5.	Availability	IOT Solutions and domains demand highly available systems for 24 x 7 operations. Isn't a critical production application, which means that operations or productiondon't go down if the IOT solution is down.
6.	Scalability	System must handle expanding load & data retention needs that are based on the upscaling of the solution scope, such as extra manufacturing facilities and extra buildings.

PROJECT DESIGN

DATA FLOW DIAGRAM:



SOLUTION AND TECHNICAL ARCHITECTURE:

a.

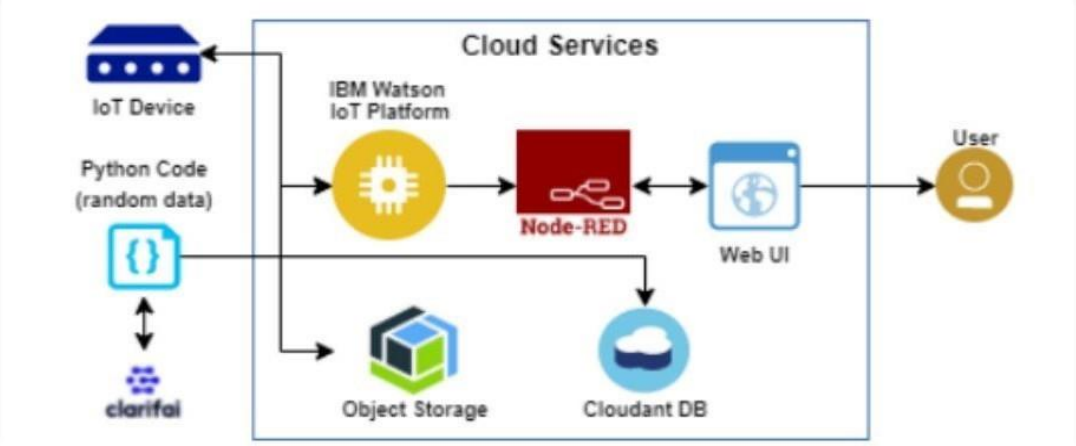


TABLE-1:

sno	components	description	Technology
1	User interface	Interacts with iot device	Html,css,angular js etc..
2	Application logic-1	Logic for a process in the application	Python
3	Application logic-2	Logic for process in the application	Clarifai
4	Application logic-3	Logic for process in the application	IBM Waston Iot platform
5	Application logic-4	logic for the process	Node red app service
6	User friendly	Easily manage the net screen appliance	Web uI

Activate Windc

TABLE-2: APPLICATION AND CHARACTERISTICS

sno	Characteristics	Description	Technology
1	Open source framework	Open source framework used	Python
2	Security implementations	Authentication using encryption	Encryptions
3	Scalable architecture	The scalability of architecture consists of 3 models	Web UI Application server-python, clarifai Database server-ibm cloud services.
4	Availability	It is increased by cloudant database	IBM cloud services

Activate Winc

USER STORIES:

SPRINT	FUNCTIONAL REQUIREMENT	USER STORY NUMBER	USER STORY/TASK	STORY POINTS	PRIORITY
Sprint-1		US-1	Create the IBM Cloud services which are being used in this project.	7	high
Sprint-1		US-2	Create the IBM Cloud services which are being used in this project.	7	high
Sprint-2		US-3	IBM Watson IoT platform acts as the mediator to connect the web application to IoT devices, so create the IBM Watson IoT platform.	5	medium
Sprint-2		US-4	In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials	6	high
Sprint-3		US-1	Configure the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT Platform.	10	high
Sprint-3		US-3	Create a Node-RED service	8	high
Sprint-3		US-2	Develop a python script to publish random sensor data such as temperature, moisture, soil and humidity to the IBM IoT platform	6	medium
Sprint-3		US-1	After developing python code, commands are received just print the statements which represent the control of the devices.	8	high
Sprint-4		US-3	Publish Data to The IBM Cloud	5	high
Sprint-4		US-2	Create Web UI in Node- Red	8	high
Sprint-4		US-1	Configure the Node-RED flow to receive data from the IBM IoT platform and also use Cloudant DB nodes to store the received sensor data in the cloudant DB	6	high

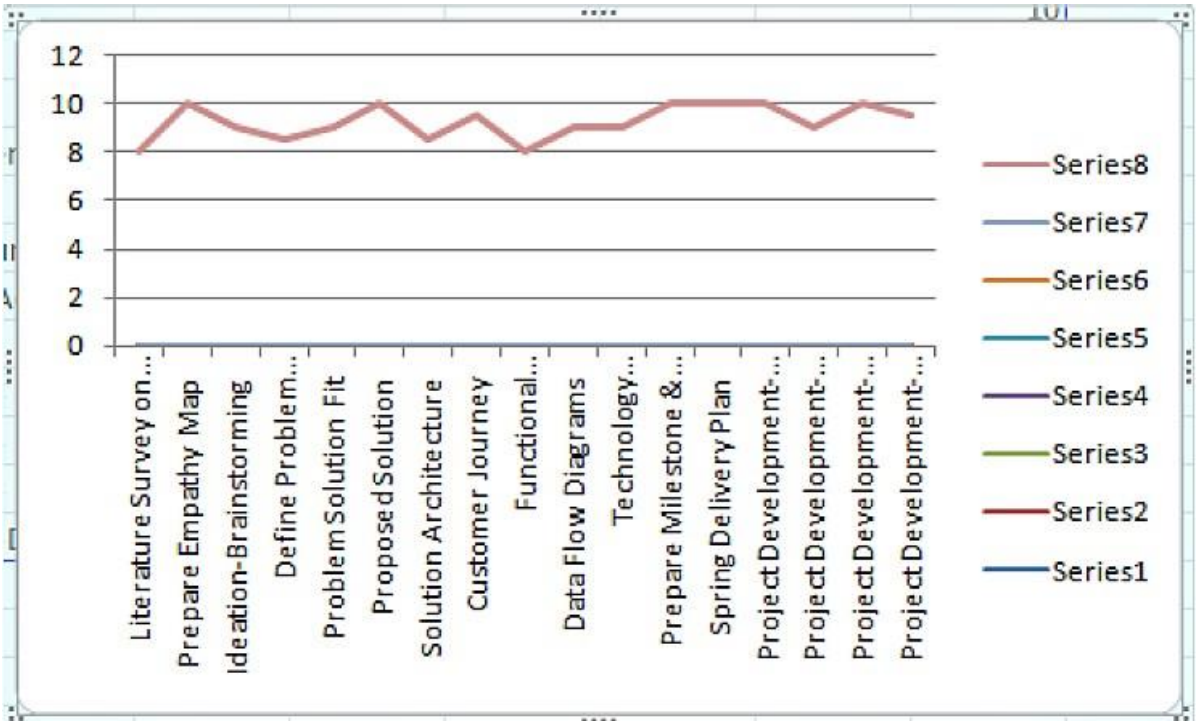
PROJECT PLANNINGAND SCHEDULING

SPRINT PLANNINGAND ESTIMATION:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$



CODING AND SOLUTIONING

FEATURE-1

```
import      random
import          ibmio
.applica on import
ibmio         .device
from   me   import
sleep import sys
#IBM Watson Device Creden als. organiza
on = "op701j" deviceType = "Lokesh"
deviceId = "Lokesh89" authMethod =
"token" authToken = "1223334444" def
myCommandCallback(cmd):
print("Command received: %s" %
cmd.data['command'])
status=cmd.data['command']  if
status=="sprinkler_on":     print ("sprinkler
is ON")  else :     print ("sprinkler is OFF")
 #print(cmd)


try:    deviceOp  ons  =  {"org":  organiza  on,  "type":  deviceType,  "id":  deviceId,  "auth-method":
authMethod, "auth-token": authToken}  deviceCli = ibmio .device.Client(deviceOp ons) except Excep
on as e:     print("Caught excep on connec ng device: %s" % str(e)) sys.exit()
#Connec ng to IBM
watson.
deviceCli.connect()
while True:
#Ge        ng values from sensors.
temp_sensor = round(
random.uniform(0,80),2)
PH_sensor =
round(random.uniform(1,14),3)
 camera = ["Detected","Not Detected","Not Detected","Not Detected","Not
Detected","Not Detected",]  camera_reading = random.choice(camera)  flame =
["Detected","Not Detected","Not Detected","Not Detected","Not
```

```
Detected","Not Detected",]  flame_reading = random.choice(flame)
moist_level = round(random.uniform(0,100),2)
 water_level = round(random.uniform(0,30),2)

#storing the sensor data to send in json format to cloud.

 temp_data = { 'Temperature' :
temp_sensor }  PH_data = { 'PH Level'
: PH_sensor }  camera_data = {
'Animal a ack' : camera_reading}
flame_data = { 'Flame' :
flame_reading }  moist_data = {
'Moisture Level' : moist_level}
 water_data = { 'Water Level' : water_level}

# publishing Sensor data to IBM Watson for every 5-10 seconds.
 success = deviceCli.publishEvent("Temperature sensor",
"json", temp_data, qos=0)  sleep(1)  if success:
    print (" .....publish ok..... ")
 print ("Published Temperature = %s C" % temp_sensor, "to IBM Watson")

 success = deviceCli.publishEvent("PH sensor", "json",
PH_data, qos=0)  sleep(1)  if success:     print
("Published PH Level = %s" % PH_sensor, "to IBM
Watson")

 success = deviceCli.publishEvent("camera", "json",
camera_data, qos=0)  sleep(1)  if success:     print
("Published Animal a ack %s " % camera_reading, "to IBM
Watson")  success = deviceCli.publishEvent("Flame
sensor", "json", flame_data, qos=0)  sleep(1)  if success:
print ("Published Flame %s " % flame_reading, "to IBM
Watson")

 success = deviceCli.publishEvent("Moisture sensor", "json",
moist_data, qos=0)  sleep(1)  if success:      print ("Published
Moisture Level = %s " % moist_level, "to IBM Watson")
success = deviceCli.publishEvent("Water sensor", "json",
water_data, qos=0)  sleep(1)  if success:     print ("Published
```

```
Water Level = %s cm" % water_level, "to IBM Watson")
print ("")
 #Automa on to control sprinklers by present temperature an to send alert message to IBM Watson.

 if (temp_sensor > 35):     print("sprinkler-1 is ON")  success = deviceCli.publishEvent("Alert1", "json",{
'alert1' : "Temperature(%s) is high, sprinkerlers are turned ON" %temp_sensor }
, qos=0)  sleep(1)  if success:     print( 'Published alert1 : ', "Temperature(%s) is high,
sprinkerlers are turned ON" %temp_sensor,"to IBM Watson")  print("") else:
 print("sprinkler-1 is OFF")
 print("")

 #To send alert message if farmer uses the unsafe fer lizer to crops.

 if (PH_sensor > 7.5 or PH_sensor < 5.5):     success = deviceCli.publishEvent("Alert2", "json",{ 'alert2'
: "Fer lizer PH level(%s) is not safe,use other fer lizer" %PH_sensor } , qos=0)  sleep(1)  if success:
print('Published alert2 : ' , "Fer lizer PH level(%s) is not safe,use other fer lizer" %PH_sensor,"to IBM
Watson")  print("")

 #To send alert message to farmer that animal a ack on crops.

 if (camera_reading == "Detected"):     success = deviceCli.publishEvent("Alert3",
"json", { 'alert3' : "Animal a ack on crops detected" }, qos=0)  sleep(1)  if success:
print('Published alert3 : ' , "Animal a ack on crops detected","to IBM Watson","to
IBM Watson")  print("")
 #To send alert message if flame detected on crop land and turn ON the splinkers to take immediate
ac on.

 if (flame_reading == "Detected"):     print("sprinkler-2 is ON")  success =
deviceCli.publishEvent("Alert4", "json", { 'alert4' : "Flame is detected crops are in danger,sprinklers
turned ON" }, qos=0)  sleep(1)  if success:     print( 'Published alert4 : ' , "Flame is detected crops are
in danger,sprinklers turned ON","to IBM Watson")

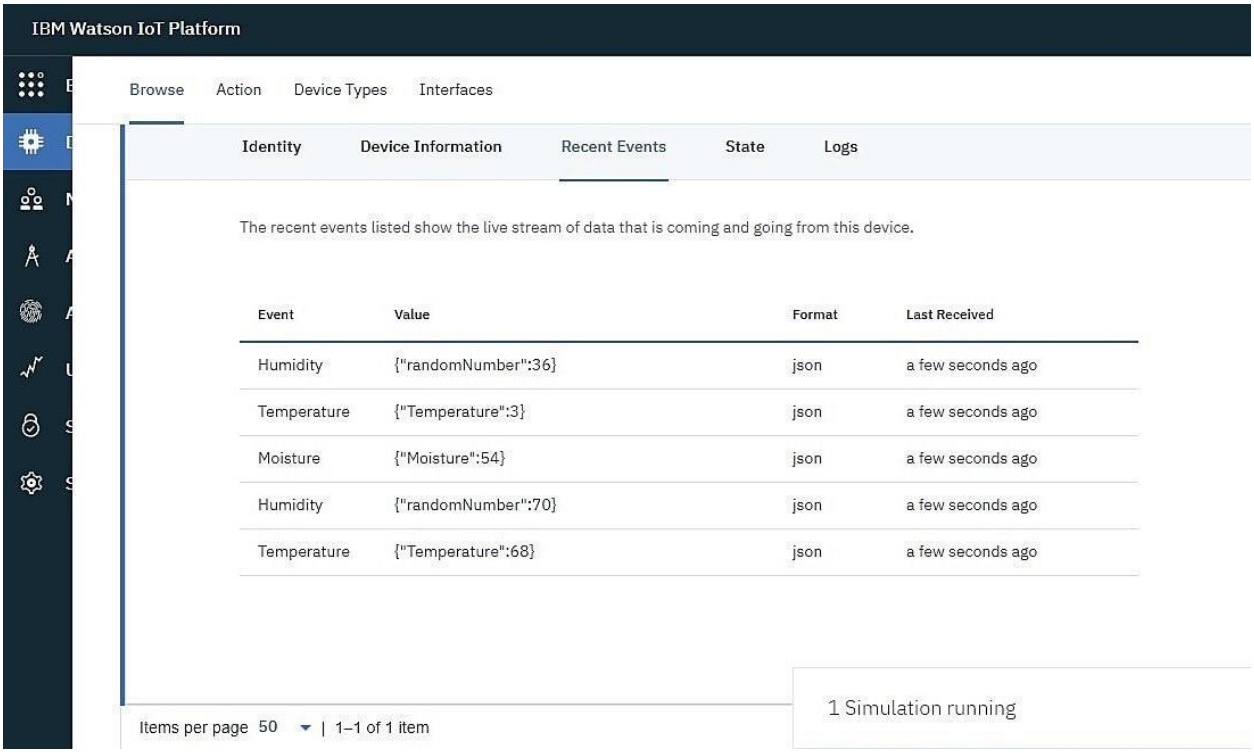
 #To send alert message if Moisture level is LOW and to Turn ON Motor-1 for irriga on.  if
(moist_level < 20):     print("Motor-1 is ON")  success = deviceCli.publishEvent("Alert5", "json", {
'alert5' : "Moisture level(%s) is low, Irriga on started" %moist_level }, qos=0)  sleep(1)  if success:
print('Published alert5 : ' , "Moisture level(%s) is low, Irriga on started" %moist_level,"to IBM
Watson" )  print("")
 #To send alert message if Water level is HIGH and to Turn ON Motor-2 to take water out.
 if (water_level > 20):     print("Motor-2 is ON")  success = deviceCli.publishEvent("Alert6",
"json", { 'alert6' : "Water level(%s) is high, so motor is ON to take water out "
%water_level }, qos=0)
```

sleep(1) if success: print('Published alert6 : ' , "water level(%s) is high, so motor is ON to take water out " %water_level,"to IBM Watson") print("")

#command recived by farmer

deviceCli.commandCallback = myCommandCallback # Disconnect the device and applica on from the cloud

deviceCli.disconnect()



Features

Output: Digital pulse high (3V) when triggered (mo on detected) digital low when idle (no mo on detected). Pulse lengths are determined by resistors and capacitors on the PCB and differ from sensor to sensor. Power supply: 5V-12V input voltage for most modules (they have a

3.3V regulator), but 5V is ideal in case the regulator has different specs.

BUZZER

Specifications

- Rated Voltage : 6V DC

- Opera ng Voltage : 4 to 8V DC
- Rated Current*: ≤30mA
- Sound Output at 10cm* : ≥85dB
- Resonant Frequency : 2300 ±300Hz
- Tone: Continuous A buzzer is a loud noise maker.

Most modern ones are civil defense or air- raid sirens, tornado sirens, or the sirens on emergency service vehicles such as ambulances, police cars and fire trucks. There are two general types, pneuma c and electronic.

FEATURE-2:

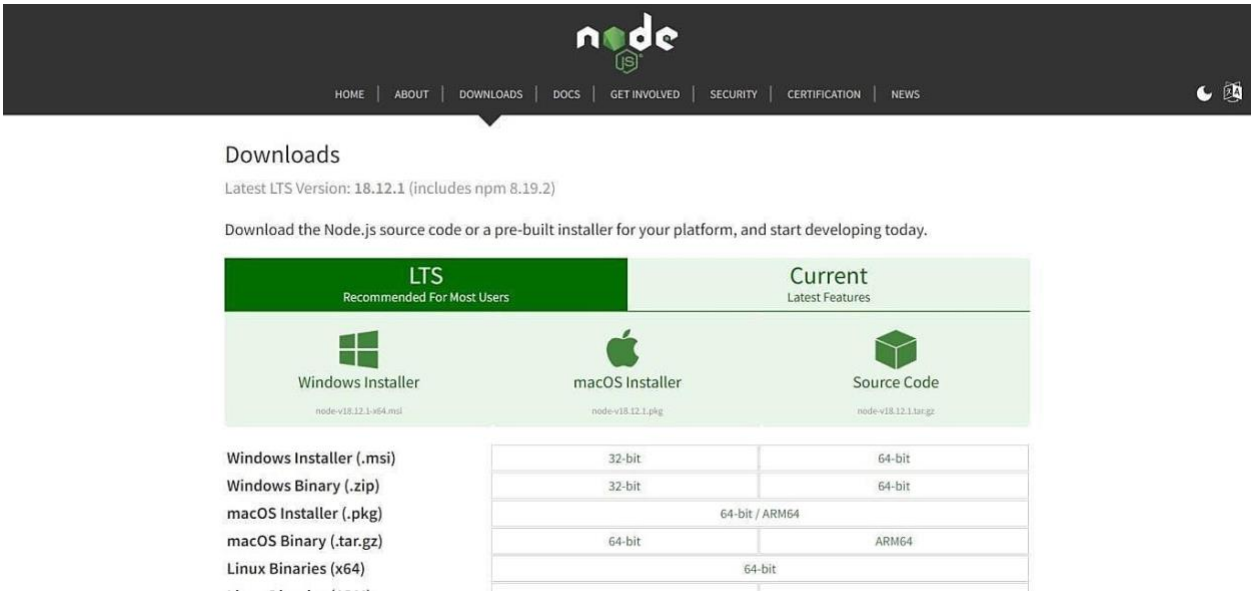
i. Good sensitivity to Combustable gas in wide range .
ii. High sensitivity to LPG, Propane and Hydrogen .
iii. Long life and low cost.
iv. Simple drive circuit.

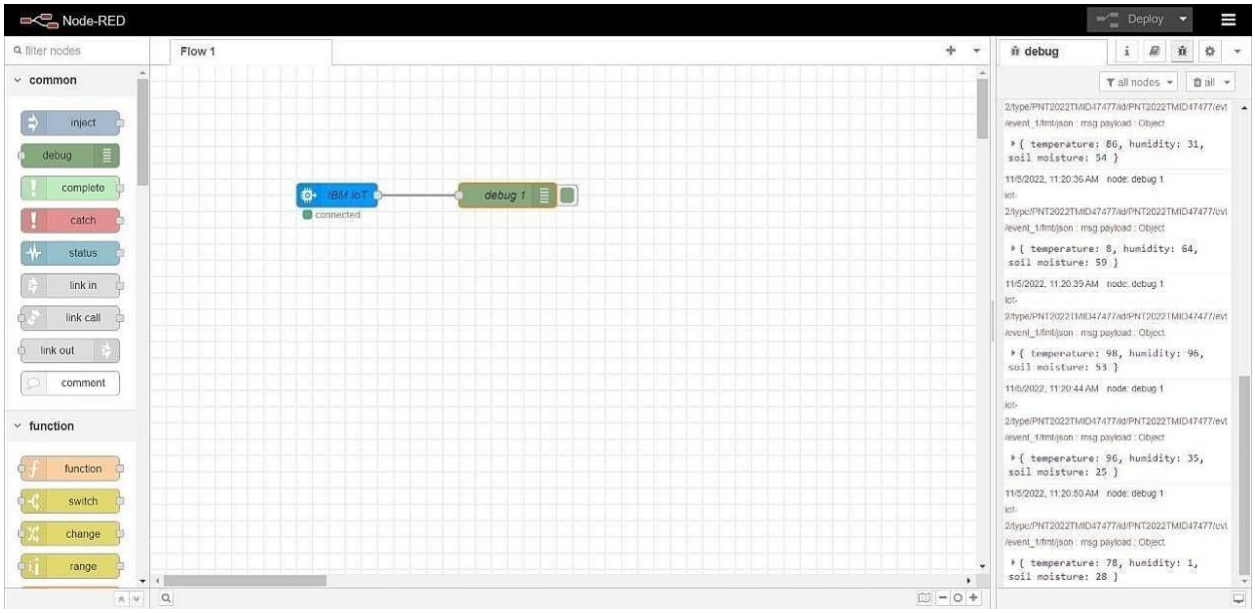
TESTING

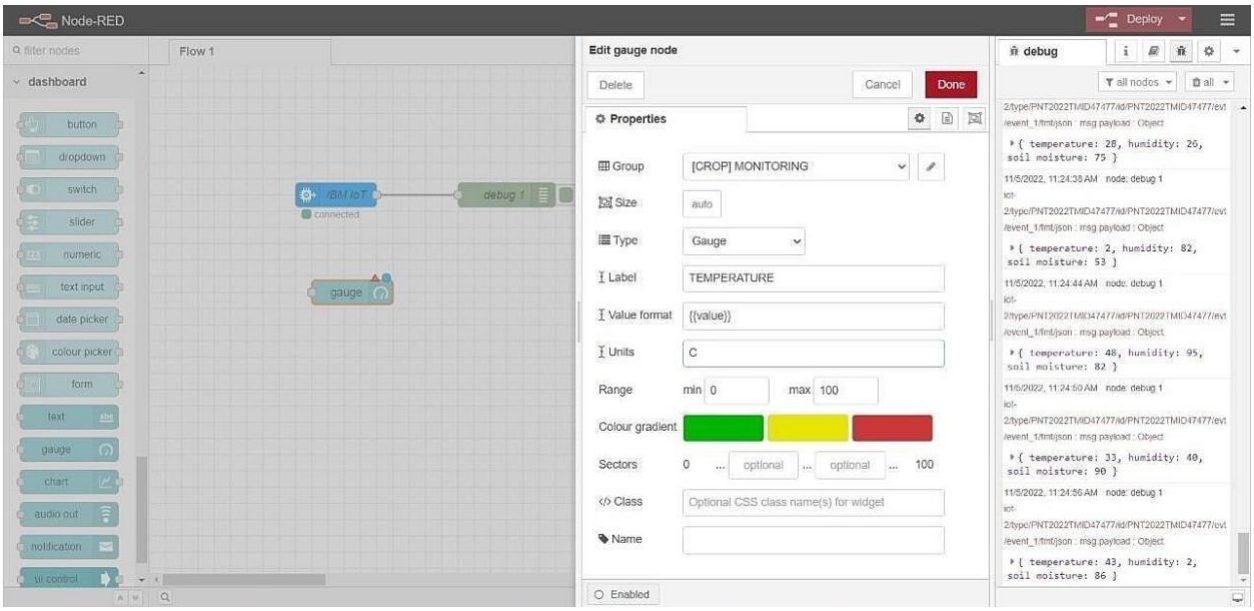
TEST CASES:

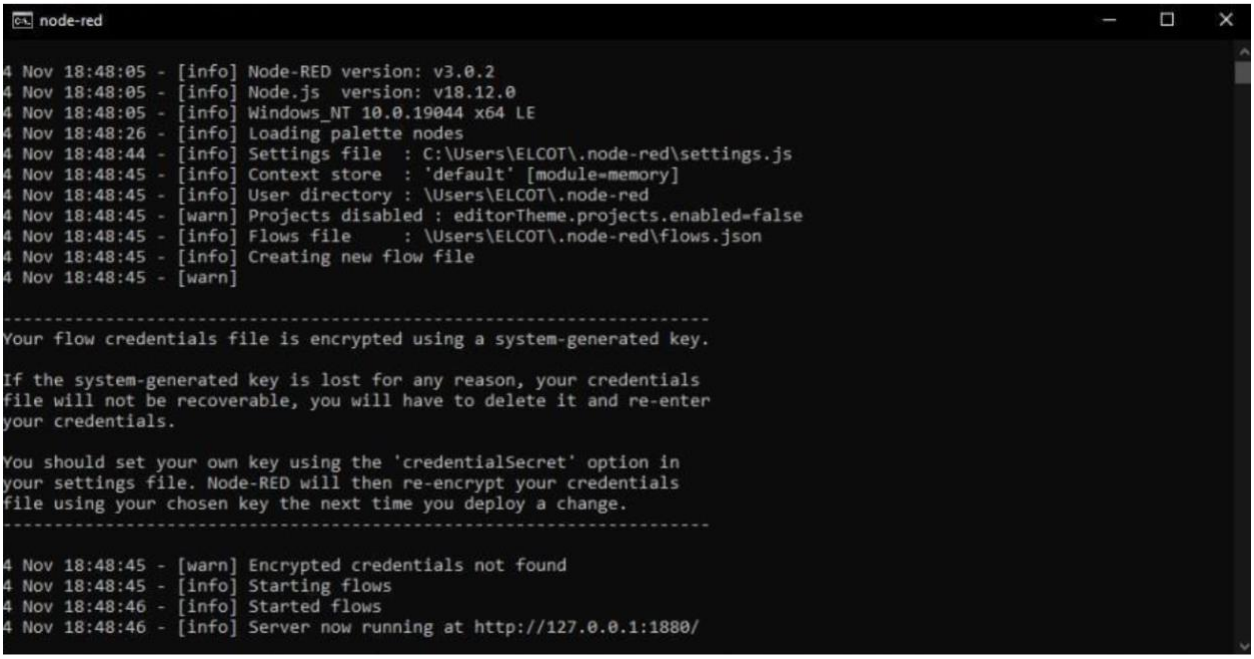
sno	parameter	Values	Screenshot
1	Model summary	-	
2	accuracy	Training accuracy-95% Validation accuracy-72%	
3	Confidence score	Class detected-80% Confidence score-80%	

User Acceptance Testing:






Node-RED
Deploy
Flow 1
dashboard
button
dropdown
switch
slider
numeric
text input
date picker
colour picker
form
text
gauge
chart
audio out
notification
ui control
IBM IoT
connected
debug 1
gauge
Edit gauge node
Delete
Cancel
Done
Properties
Group
[CROP] MONITORING
Size
auto
Type
Gauge
Label
TEMPERATURE
Value format
{{value}}
Units
C
Range
min 0
max 100
Colour gradient
Sectors
0
optional
optional
100
Class
Optional CSS class name(s) for widget
Name
Enabled
debug
all nodes
all
{ temperature: 28, humidity: 26, soil moisture: 75 }
11/5/2022, 11:24:38 AM node: debug 1
{ temperature: 2, humidity: 82, soil moisture: 53 }
11/5/2022, 11:24:44 AM node: debug 1
{ temperature: 48, humidity: 95, soil moisture: 82 }
11/5/2022, 11:24:50 AM node: debug 1
{ temperature: 33, humidity: 40, soil moisture: 90 }
11/5/2022, 11:24:56 AM node: debug 1
{ temperature: 43, humidity: 2, soil moisture: 86 }


node-red
4 Nov 18:48:05 - [info] Node-RED version: v3.0.2
4 Nov 18:48:05 - [info] Node.js version: v18.12.0
4 Nov 18:48:05 - [info] Windows_NT 10.0.19044 x64 LE
4 Nov 18:48:26 - [info] Loading palette nodes
4 Nov 18:48:44 - [info] Settings file : C:\Users\ELCOT\.node-red\settings.js
4 Nov 18:48:45 - [info] Context store : 'default' [module=memory]
4 Nov 18:48:45 - [info] User directory : \Users\ELCOT\.node-red
4 Nov 18:48:45 - [warn] Projects disabled : editorTheme.projects.enabled=false
4 Nov 18:48:45 - [info] Flows file : \Users\ELCOT\.node-red\flows.json
4 Nov 18:48:45 - [info] Creating new flow file
4 Nov 18:48:45 - [warn]
Your flow credentials file is encrypted using a system-generated key.
If the system-generated key is lost for any reason, your credentials
file will not be recoverable, you will have to delete it and re-enter
your credentials.
You should set your own key using the 'credentialSecret' option in
your settings file. Node-RED will then re-encrypt your credentials
file using your chosen key the next time you deploy a change.
4 Nov 18:48:45 - [warn] Encrypted credentials not found
4 Nov 18:48:45 - [info] Starting flows
4 Nov 18:48:46 - [info] Started flows
4 Nov 18:48:46 - [info] Server now running at http://127.0.0.1:1880/

RESULTS

The problem of crop vandalization by wild animals and fire has become a major social problem in current time.

It requires urgent attention as no effective solution exists till date for this problem. Thus this project carries a great social relevance as it aims to address this problem. This project will help farmers in protecting their orchards and fields and save them from significant financial losses and will save them from the unproductive efforts that they endure for the protection their fields. This will also help them in achieving better crop yields thus leading to the economic wellbeing.

ADVANTAGES AND DISADVANTAGES

Advantage:

Controllable food supply. you might have droughts or floods, but if you are growing the crops and breeding them to be hardier, you have a better chance of not starving. It allows farmers to maximize yields using minimum resources such as water ,fertilizers.

Disadvantage:

The main disadvantage is the time it can take to process the information.in order to keep feeding people as the population grows you have to radically change the environment of the planet

CONCLUSION:

A IoT Web Application is built for smart agricultural system using Watson IoT platform, Watson simulator, IBM cloud and Node-RED

FUTURE SCOPE

In the future, there will be very large scope, this project can be made based on Image processing in which wild animal land fire can be detected by cameras and if it comes towards farm then system will be directly activated through wireless networks. Wild animals can also be detected by using wireless networks such as laser wireless sensors and by sensing this laser or sensor's security system will be activated.

APPENDIX

SOURCE CODE

```
import me importsys
 import ibmio .application # to installpip
install ibmio  impor bmio .device


# Provide your IBM Watson Device Creden als organiza on = "8gyz7t"
# replace the ORG ID deviceType = "weather_monitor"
# replace the Device type deviceId = "b827ebd607b5" # replace
Device ID authMethod = "token" authToken =
"LWVpQPaVQ166HWN48f" # Replace the authtoken
def myCommandCallback(cmd): # func on for
Callbackif


    cm.data['command'] == 'motoron':


print("MOTOR ON IS RECEIVED")
 elif cmd.data['command'] == 'motoroff': print("MOTOR OFF IS
RECEIVED")
 if cmd.command == "setInterval":


else:
if 'interval' not in cmd.data: print("Error - command is
  missing requiredinforma on: 'interval'")


  interval = cmd.data['interval']
```

```
   elif cmd.command == "print": if 'message' not in cmd.data:
print("Error - commandis missing requiredinforma on: 'message'")
else:output = cmd.data['message'] print(output)

try:

      deviceOp ons = {"org": organiza on, "type": deviceType, "id": deviceId, "authmethod":
   authMethod,
                        "auth-token": authToken}              deviceCli
= ibmio .device.Client(deviceOp ons) #
.....

exceptExcep on as e: print("Caught excep on connec ng

      device: %s" % str(e)) sys.exit()


   # Connect and send a datapoint "hello" with value "world" into the cloud as an event of type
   "gree ng"
   10 mes
deviceCli.connect()


while True: deviceCli.commandCallback =

      myCommandCallback


# Disconnect the device and applica on from the cloud deviceCli.disconnect()
```

SENSOR.PY

```
  import          me
  import
  sysimport  ibmio
  .applica          on
  impor         bmio
  .device
import random
```

```
  # Provide your IBM Watson Device Creden als organiza on = "8gyz7t"
  # replace the ORG ID deviceType = "weather_monitor" # replace the
  Device type deviceId = "b827ebd607b5" # replace Device ID
  authMethod = "token" authToken = "LWVpQPaVQ166HWN48f" #
  Replace the authtoken



def myCommandCallback(cmd):

      print("Command received: %s" % cmd.data['command'])
  print(cmd)

 try:
            deviceOp ons = {"org": organiza on, "type": deviceType, "id": deviceId,
  "auth-method": authMethod, "auth-token": authToken}
  deviceCli = ibmio .device.Client(deviceOp ons)
            #.....

exceptExcep on as e:
          print("Caught excep on connec ng device: %s" % str(e)) sys.exit()


  # Connect and send a datapoint "hello" with value "world" into the cloud as an event of type
  "gree ng"
  10 mes
deviceCli.connect()


while True:
        temp=random.randint(0
        ,1
  00)
  pulse=random.randint(0,100)
        soil=random.randint(0,100)
```

```
        data = { 'temp' : temp, 'pulse': pulse ,'soil':soil}
        #print data              def
  myOnPublishCallback():
            print ("Published Temperature = %s C" % temp, "Humidity = %s %%" %
  pulse,"Soil Moisture = %s %%" % soil,"to IBM Watson")

        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
  on_publish=myOnPublishCallback)                    if not success:
  print("Not connected to
        IoTF") me.sleep(1)

        deviceCli.commandCallback = myCommandCallback

# Disconnect the device and applica on from the cloud deviceCli.disconnect()
```

Node-RED FLOW :

```
[
{
"id":"625574ead9839b34
",
"type":"ibmiotout", "z":"630c8601c5ac3295",
"authen ca on":"apiKey",
"apiKey":"ef745d48e395ccc0",
"outputType":"cmd",
"deviceId":"b827ebd607b5",
"deviceType":"weather_monitor",
"eventCommandType":"data",
"format":"json",
"data":"data",
"qos":0,
```

"name":"IBM
IoT",
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tere d",
"x":680,
"y":220,
"wires":[]
},
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"id":"4cff18c3274cccc4", "type":"ui_bu on",
"z":"630c8601c5ac3295",
"name":"",
"group":"716e956.00eed6c",
"order":2,
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"height":"0",

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"color":"",
"bgcolor":"",
"className":"",
"icon":"",
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"payloadType":"str",
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"y":160, "wires":[["625574ead9839b34"]]},
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"name":"",
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"height":"0",
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"tool p":"",
"color":"",
"bgcolor":"",
"className":"",
"icon":"",
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tr", "x":350,

"y":220, "wires":[["625574ead9839b34"]]}, {"id":"ef745d48e395ccc0", "type":"ibmiot",
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"shared":false},
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"type":"ui_group",
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", "order":1,
"disp":true,
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"collapse":fal

se},
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"type":"ui_tab",
"name":"contorl",
"icon":"dashboard
", "order":1,
"disabled":false,
"hidden":false}
]

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{
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"apiKey":"ef745d48e395ccc0",

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"logicalInterface":"",
"ruleId":"",
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"applica onId":"",
"deviceType":"weather_monitor", "eventType":"+",
"commandType":"",
"format":"json",
"name":"IBMIoT",
"service":"registered",
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"allApplica ons":"",
"allDeviceTypes":"",
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"allCommands":"",

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"allFormats
":"",
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"y":180,
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  78bcf1"]]
},
{
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",
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"z":"03acb6ae05a0c712
", "name":"Soil
Moisture",
  "func":"msg.payload =
msg.payload.soil;\nglobal.set('s',msg.payload);\nreturn msg;", "outputs":1,
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":"",
"finalize":"",
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:[],
"x":490,
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},
{
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"z":"03acb6ae05a0c712",
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```

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":"",
"finalize":"",
"l
is
t
":
[]
,
"
x
":
4
8
0
,
"y":260, "wires":[["a949797028158f3f","70a5b076eeb80b70"]]
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"type":"debug",
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"console":false,
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"statusVal":"",
"statusType":"auto",

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"wires":[]
},

{
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"group":"f4cb8513b95c98a4",
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"height":"0",
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"label":"Percentage(%)",
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"max":"100",
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"seg2":"",
"className
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"z":"03acb6ae05a0c712",
"name":"Temperature",

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"outputs":1, "noerr":
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":"",
"finalize":"",
"l
i
b
s
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],
"x
":
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"y":360,

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},
{
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"type":"ui_gauge",
"z":"03acb6ae05a0c712",
"name":"",
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"order":11,
"width":"0",
"height":"0",
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" tle":"Temperature",
"label":"DegreeCelcius",
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"max":"100",

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"seg2":"",
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"y":360,
"wires":[]
},
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"z":"03acb6ae05a0c712",
"name":"",
"group":"f4cb8513b95c98a4",
"order":1,
"width":"0",
"height":"0",
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" tle":"Soil Moisture",
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"max":"100",
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"seg2":"",
"className
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"y":120,
"wires":[]
},
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als e,
"swaggerDoc"
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},
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"z":"03acb6ae05a0c712",
"name":"h pfunc on",
"func":"msg.payload{\"pulse\":global.get('p'),\"temp\":global.get('t'),\"soil\":global.get(
's')};\nreturn msg;",
"outputs":1,
"noerr":0,
"ini alize":"",
"finalize":"",
"l
i
b
s
":[
],
"x
":
63

```
0,
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},
{
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",
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", "name":"",
"statusCode":"",
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s":{},
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"wires":[]
},
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"id":"ef745d48e395ccc0",
"type":"ibmiot",
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"keepalive":"60",
"serverName":"",
"cleansession":true,
"appId":"",
"shared":false},
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"id":"f4cb8513b95c98a4", "type":"ui_group",
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```

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alse,
"className
":""
},
{
"id":"1f4cb829.2fdee8",
"type":"ui_tab",
"name":"Home",
"icon":"dashboard
", "order":3,
"disabled":false,
"hidden":false }